



SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		III/II		Program			B.Tech – Artificial Intelligence and Data Science				
Subject Category	DC	Subject Code:		AI 302	Subject Name		Analysis and Design of Algorithms				
Maximum Marks Allotted							Contact Hours			Total Credits	
Theory				Practical			Total Marks	L	T		P
ES	MS	Assignment	Quiz	ES	LW	Quiz					
60	20	10	10	30	10	10	150	3	0	2	4
Prerequisites:											
<ul style="list-style-type: none"> • Data Structure 											
Course Objective:											
<ul style="list-style-type: none"> • Determine different time complexities of a given algorithm • Demonstrate algorithms using various design techniques. • Develop algorithms using various design techniques for a given problem. 											
UNITs	Descriptions										Hrs.
I	Algorithms: Definition and characteristics. Analysis: Space and Time Complexity, Asymptotic Notations, Time Complexity Analysis of algorithms (Linear Search, Insertion Sort etc.) Recursive algorithms and recurrence relations. Solutions of recurrence relations. Divide and conquer technique, analysis, design and comparison of various algorithms based on this technique, example binary search, quick sort, merge sort, Heap Sort, Strassen's matrix multiplication with their complexity analysis.										8
II	Greedy Algorithms: Knapsack problem, Job sequencing with deadlines, optimal merge patterns, Huffman coding, Dynamic Programming: Multistage Graph, all pairs shortest paths, 0-1 Knapsack, Chained matrix multiplication, longest common subsequence, Travelling salesperson problem.										8
III	Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms- Dijkstra's Algorithms and Complexity Analysis, Transitive closure, Minimum Spanning Tree- Prim's and Kruskal's Algorithm and their complexity analysis, Union Find Data Structure, Topological sorting, Network Flow Algorithm.										8
IV	Branch & Bound technique: Definition and application to solve 0/1 Knapsack Problem, 8-puzzle problem, travelling salesman problem. Back tracking concept and its examples like 8 Queens's problem, Hamiltonian cycle, Graph Coloring problem.										8
V	Tractable and Intractable Problems: Computability of Algorithms- P, NP, NP-complete and NP-hard. Introduction to Approximation Algorithms, NP-complete problems and Reduction techniques. Lower bound theory and its use in solving algebraic problem.										8
Total Hours											40
Course Outcomes:											
CO-1: Analyze and justify the running time complexity of algorithms CO-2: Articulate the effectiveness of divide and conquer methods to solve searching, sorting and other problems. CO-3: Understand the combinatorial problems and justify the use of Greedy and Dynamic Programming techniques to solve them. CO-4: Model graph or tree for a given engineering problem, and write the corresponding algorithm to solve it. CO-5: Able to analyses the NP-complete											
Text Book											

1. Thomas Cormen, Charles Leiserson, Ronald Rivest and Clifford Stein, "Introduction to Algorithms", PHI, 3rd edition.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press.

Reference Books-

Gilles Brassard and Paul Bratley, "Fundamentals of Algorithmics", PHI.

List/Links of e-learning resource

- <https://archive.nptel.ac.in/courses/106/106/106106131/>

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

1. Understand the working of Ubuntu operating system and basic commands for implementing
2. Algorithm in c programming in Ubuntu operating system using gcc compiler.
3. Write a simple c program to add two integer numbers.
4. Implement Algorithm to calculate factorial of given number using iteration method and recursive Method.
5. Implement logic to swap two integer numbers using three different approaches.
6. Implement Algorithm to determine if a given number is divisible by 5 or not without using % Operator.
7. Implement Algorithm to convert binary number to decimal number without using array and Power function.
8. Implement Algorithm to print reverse of string using recursion and without using character Array.
9. Implement Linear Search Algorithm.
10. Implement Binary Search Algorithm (By using Iterative Approach)
11. Implement Binary Search Algorithm (By using Recursive Approach)
12. Implement Insertion Sort Algorithm
13. Implement Quick Sort Algorithm (By using Recursive Approach)
14. Implement Quick Sort Algorithm (By using Non-Recursive Approach).
15. Implement Merge Sort Algorithm.

Recommendation by Board of studies on

Approval by Academic council on

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Subject handled by department

Department of CS & IT



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DEPARTMENT OF IT

Semester/Year		III/II		Program			B.Tech – Artificial Intelligence and Data Science				
Subject Category	DC	Subject Code:		AI 303		Subject Name	Object Oriented Programming				
Maximum Marks Allotted							Contact Hours			Total Credits	
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz				L	T
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

Fundamentals of programming Skills

Course Objective:

- Enable students to understand concepts and principles of object-oriented programming methodologies using JAVA as a vehicle.
- Also learn software development and problem solving using this JAVA technology.

UNITS	Descriptions	Hrs.
I	Introduction: Procedural Paradigms of programming, Object Oriented Paradigm for programming, Procedural vs. Object Oriented Programming, Principles of OOP, Benefits and applications of OOP. OOP Concepts: Data Abstraction, Encapsulation, Inheritance and Polymorphism. Introduction of Java, Features of Java, Byte Code and Java Virtual Machine, Java Development Kit (JDK). Basics of objects and classes in Java, tokens, keywords, identifiers, variables, data types, and operators in java, Type casting, strict fp keyword.	8
II	Control Statements — If, else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue. Command Line Argument, Classes and Objects, Encapsulation, Tightly Encapsulated classes, Nested class, Inner class, and Anonymous inner class. Inbuilt classes: Object, String, String Buffer, Array, Vector. Wrapper classes. Data members, member Function, Data Hiding: Visibility modifiers in java.	8
III	Is-A relationship, Has-A relationship, Inheritance in Java, types of inheritance, Super and sub class, Method Signature. Overloading, Constructor Overloading, Method Overloading, this and static keyword, finalize () method, Casting objects, Instance of operator, Overriding, covariant return type. Super, final keyword, overloading vs. overriding. Static control flow, instance control flow.	8
IV	Abstraction: Abstract class, Interface in Java, differences between classes and interfaces. Defining an interface, implementing interface, applying interfaces, variables in interface, extending interfaces. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages. Coupling, Cohesion.	8
V	Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes. Multithreading: Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface. Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks, thread groups. Introduction of java micro services.	8
Total Hours		40

Course Outcomes:

CO-1 Define classes, objects, members of a class and relationships among them needed for a specific program.

- CO-2** Write the java application programs using OOPs principles.
CO-3 Write java application on constructors, overloading.
CO-4 Demonstrate package creating and accessing members of a packages.
CO-5 Understand and develop collection frame work and its application programs.

Text Book

1. Naughton & Schildt, "The Complete Reference Java 2", Tata McGraw Hill
2. E Balaguruswamy, "Programming in Java", TMH Publications

Reference Books-

1. Deitel "Java-How to Program:" Pearson Education, Asia
2. Horstmann & Cornell, "Core Java 2" (Vol I & II), Sun Microsystems
3. Ivan Bayross, "java 2.0", BPB publications
4. Java Programming for the absolute beginners By Russell, PHI Learning
5. Java Programming by Hari Mohan Pandey, Pearson.

List/Links of e-learning resource

- <https://archive.nptel.ac.in/courses/106/105/106105153/>

Modes of Evaluation and Rubric

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CO-PO Mapping:

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂	PSO1	PSO2
CO-1	1	1									3	3	3	2
CO-2	1		1	2							2	1	3	2
CO-3	2	1									2	2	1	2
CO-4	3	2	3	2	1			1	2		3		3	1
CO-5	3	3	2	1				2		2	2	3	1	1

Suggestive list of experiments:

1. Write a java program to find the Fibonacci series using recursive and non-recursive functions.
2. Write a java program to multiply two given matrices.
3. Write a java program for Method overloading and Constructor overloading.
4. Write a java program to display the employee details using Scanner class.
5. Write a java program that checks whether a given string is palindrome or not.
6. A. Write a java program to represent Abstract class with example.
B. Write a java program to implement Interface using extends keyword.
7. A. Write a java program to create inner classes.
B. Write a java program to create user defined package.
8. A. Write a java program for creating multiple catch blocks.
B. Write a java program for producer and consumer problem using Threads.
9. Write a Java program that implements a multi-thread application that has three threads.
10. A. Write a java program to display File class properties.
B. Write a java program to represent ArrayList class.
C. Write a Java program loads phone no, name from a text file using hashtable.
11. Write an applet program that displays a simple message.
12. A. Write a Java program computes factorial value using Applet.
B. Write a program for passing parameters using Applet.
13. A. Write a java program for handling Mouse events and Key events.
B. Write a java program for handling Key events.
14. Write a java program that connects to a database using JDBC.
15. A. Write a java program to connect to a database using JDBC and insert values into it.
B. Write a java program to connect to a database using JDBC and delete values from it.
16. Write a java program that works as a simple calculator. Use a Grid Layout to arrange Buttons for digits and for the + - * %operations. Add a text field to display the result

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Subject handled by department	Department of CS & IT



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DEPARTMENT OF IT

Semester/Year		III/II		Program			B.Tech – Artificial Intelligence and Data Science				
Subject Category	DC	Subject Code:		AI-304		Subject Name	Operating System				
Maximum Marks Allotted							Contact Hours			Total Credits	
Theory				Practical			Total Marks	L	T	P	Total Credits
ES	MS	Assignment	Quiz	ES	LW	Quiz					
60	20	10	10	30	10	10	150	3	0	2	4
Prerequisites:											
Computer Fundamentals											
Course Objective:											
To understand operating system architecture and functioning along with in-depth knowledge of internals and working of OS modules like process management, Storage management, file system, security and Protection											
UNITs	Descriptions										Hrs.
I	Overview-Introduction to Operating Systems, Evolution of Operating System mainframe, desktop, multiprocessor, Distributed, Network Operating System, and Clustered and Handheld System), Operating System Structure- Operating System Services and System Calls, System Programs. Types of Operating Systems: Batch Processing, Real-Time, Multitasking, and Multiprogramming, time-sharing system and Distributed Operating Systems, Objectives and functions of OS.										8
II	Process Management-Concept, Process Control Blocks (PCB), Process Scheduling. Scheduling Criteria, Scheduling Algorithms, and their Evaluation. Threads Overview and Multithreading .										8
III	Inter Processes Communication and Critical Section Problem and Solution-Semaphores and Monitors, Deadlock Characterization, Methods for Deadlock handling, deadlock prevention, deadlock avoidance, deadlock detection and Recovery from Deadlock										8
IV	Storage Management-Memory Hierarchy, Concepts of memory management, MFT and MVT, logical and physical address space, swapping, contiguous and non-contiguous allocation, Paging and Segmentation Structure and Implementation of Page table, Virtual memory, Cache Memory Organization, Demand paging, Page replacement Algorithms. Thrashing, Demand segmentation.										8
V	File and Disk Management-File concepts, Access methods, Directory Structure, File Sharing and Protection, Free space management, Disk Scheduling, Efficiency, and Performance- A case study on Unix, Linux, and Windows.										8
Total Hours										40	

Course Outcomes:

CO1: Explain the inherent mechanism involved in the functioning of an operating system. Differentiate and justify the need for various operating systems.

CO2: Analyse various scheduling techniques with their comparisons.

CO3: Analyse various synchronization techniques with their comparisons to derive the solution for the deadlock situation.

CO4: Describe the memory management system of an operating system. Analyse and compare various management schemes.

CO5: Describe and Analyze File and Disk Management Techniques.

Text Book

1. Peterson, J.L. & Silberschatz, A.: Operating System Concepts, Addison, Wesley-Reading.
2. Brinch, Hansen: Operating System Principles, Prentice Hall of India.

Reference Books-

1. Haberman, A.N.: Introduction to Operating System Design Galgotia Publication, New Delhi.
2. Tanenbaum, A.S.: Operating Systems.
3. Hansen, P.B.: Architecture of Concurrent Programs, PHI.
4. Shaw, A.C.: Logic Design of Operating Systems, PHI.

List/Links of e-learning resource

- <https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs10/>

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid-semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

Cos	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂	PSO ₁	PSO ₂
CO-1		2			2							2	1	2
CO-2	2	3		2	1						1	2	3	3
CO-3	2	3	3	2								2	2	2
CO-4	2	2		2								2	3	3
CO-5	2	2	2									2	3	3

Suggestive list of experiments:

1. Implementation of Basic Linux Commands.
2. Implementation of Process Related System Calls (Fork).
3. Write a program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time. a) FCFS b) SJF
4. Write a program to simulate the following CPU scheduling algorithms to find turnaround time and waiting time. a) Round Robin b) Priority
5. Write a C program to simulate page replacement algorithms) FIFO b) LRU c) OPTIMAL
6. Write a program to simulate Bankers algorithm for the purpose of deadlock avoidance.
7. Write a program to simulate disk scheduling algorithms a) FCFS b) SCAN c) C-SCAN

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DEPARTMENT OF IT

Semester/Year		III/II		Program			B.Tech – Artificial Intelligence and Data Science				
Subject Category	DL	Subject Code:		AI- 306	Subject Name		Internet Programming				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks	L	T	P	
ES	MS	Assignment	Quiz	ES	LW	Quiz					
				30	10	10	50	0	0	4	

Prerequisites:

Basic knowledge of computers, its components and programming skills

Course Objective:

Understand Static and Dynamic Web Pages.

UNITs	Descriptions	Hrs.
I	WEBSITE BASICS, Web Essentials: Clients, Servers and Communication, The Internet, Basic Internet protocols, World wide web.	7
II	HTTP Request Message, HTTP Response Message, Web Clients, Web Servers, HTML5, Tables, Lists, Image, HTML5 control elements, Semantic elements, Drag and Drop, Audio , Video control	8
III	CSS3, Inline, embedded and external style sheets, Rule cascading, Inheritance, Backgrounds, Border Images, Colors Shadows, Text, Transformations, Transitions, Animations.	7
IV	Java Script: An introduction to JavaScript, JavaScript DOM Model-Date and Objects, function, Regular Expressions.	7
V	Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript. XML- Elements, attributes, parser, DOM, query.	7
Total Labs (practical's min)		36

Course Outcomes:

CO1: To understand and interpret the basic concepts of the Internet, tools.

CO2: To understand, analyse CSS components and apply them web page design tools like HTML, CSS.

CO3: To know and analyse client side scripting language concepts.

CO4: Design and Develop Internet applications with the help of Java script.

CO5: Understand the concept of exceptional handling

Text Book

1. Achyut Godbole, Atul Kahate " ; Web Technologies: TCP/IP, Web/Java Programming, and Cloud Computing”, Third Edition, McGraw Hill Education.
2. Deitel, Deitel, Goldberg, " ; Internet & amp; World Wide Web How to Program & quot;,, Third Edition, Pearson Education.

Reference Books-

1. Raj Kamal, “Internet and Web Technologies”, Tata McGraw-Hill.

List/Links of e-learning resource

- <https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs10/>

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid-semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂	PSO1	PSO2
CO1	2	1	2										1	1
CO2	2	1	2										1	1
CO3	2	1	2										1	2
CO4	2	2	2										1	2
CO5	1	2	2	1	2								2	1

Suggestive list of experiments:

1. Design a web page to display your CV.
2. Design a web page using HTML tags to take the input in a form and display it in another page/frame.
3. Design a web page to isolate a part of the text that might be formatted in a different direction from other text outside it
4. Create a Zebra Striping a Table and make an image rounded with CSS3.
5. Create speech bubble shape and Image cross effect with CSS3 transition.
6. Using HTML, CSS create a styled checkbox with animation on state change.
7. Using HTML, CSS create display an image overlay effect on hover.
8. Using HTML, CSS create a list with floating headings for each section.
9. Using HTML, CSS, JavaScript create a typewriter effect animation.
10. Using HTML, CSS create an animated underline effect when the user hovers over the text.
11. Write a JavaScript program to set paragraph background color.
12. Write a JavaScript function to add rows to a table.
13. Write a JavaScript function that accepts a row, column (to identify a particular cell) and a string to update the cell’s content.
14. Write a JavaScript program to highlight the bold words of the following paragraph, on mouse over a certain link.
15. Write a JavaScript program to get the window width and height (any time the window is resized).

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Approval by Academic council on

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Subject handled by department	Department of CS & IT
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Open Courses launched by respective Programmes are not applicable for students of parental programme.

Open Course Offered by AIADS Session: 2023-24 Semester III			
Open Elective-I OE-I	OE-305 (A)	OE-305 (B)	OE-305 (C)
	Computer System Organisation	Operating System	Data Structure
Prerequisite	Fundamental knowledge of digital electronics	Computer Programming	Logical thinking and Computer Fundamentals
Remark	Open to All	Not Applicable for - CSE & CSE(BC)	Not Applicable for - CSE and Allied branches, EC



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DEPARTMENT OF IT

Semester/Year		III/II		Program			B.Tech – Artificial Intelligence and Data Science				
Subject Category	OE	Subject Code:		OE-305-A	Subject Name		Computer System Organization				
Maximum Marks Allotted							Contact Hours			Total Credits	
Theory				Practical			Total Marks	L	T	P	Total Credits
ES	MS	Assignment	Quiz	ES	LW	Quiz	L	T	P	Total Credits	
60	20	10	10				3	0	0	3	

Prerequisites:

Fundamental knowledge of digital electronics.

Course Objective:

- Understand the organization and architecture of computer systems and electronic computers.
- Study the assembly language program execution, instruction format, and instruction cycle.
- Design a simple computer using hardwired and microprogrammed control methods.
- Study the basic components of computer systems besides computer arithmetic.
- Understand input-output organization, memory organization and management, and pipelining

UNITs	Descriptions	Hrs.
I	Introduction: Function and structure of a computer, Functional components of a computer, Interconnection of components, Performance of a computer, Register Transfer language : Register Transfer, Bus and Memory Transfers, Three-State Bus Buffers, Memory Transfer, Arithmetic Microoperations Binary Adder, Binary Adder-Subtractor, Binary incrementor, Arithmetic Circuit, Logic Microoperations, Shift Microoperations, Arithmetic Logic Shift Unit, List of Logic Microoperations, , Shift Micro operations, Arithmetic Logic Shift Unit	7
II	Control unit: Control memory, address sequencing, micro program example, Microinstruction Format, Symbolic Microinstructions, The Fetch Routine, Symbolic Micro program and design of the control unit, Microprogram Sequencer.	7
III	CPU design: Instruction cycle, data representation, memory reference instructions, input-output, and interrupt, addressing modes, data transfer and manipulation, program control. Computer arithmetic: Addition and subtraction, floating point arithmetic operations, decimal arithmetic unit.	7
IV	Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory; Input or output organization: Input or output Interface, asynchronous data transfer, modes of transfer, priority interrupt, direct memory access	7
V	Pipeline: Parallel processing, pipelining-arithmetic pipeline, instruction pipeline; Multiprocessors: Characteristics of multiprocessors, interconnection structures, inter-processor arbitration, inter-processor communication and synchronization.	7
Total Hours		35

Course Outcomes:

- CO1: Understand the organization and levels of design in computer architecture.
- CO2: Describe Register transfer languages, arithmetic micro-operations, logic micro-operations, shift micro-operations address sequencing, micro program example, and design of control unit
- CO3: Understand the Instruction cycle, data representation, memory reference instructions, input-output, and interrupt, addressing modes, data transfer, and manipulation, program control. Addition and subtraction, floating point arithmetic operations, decimal arithmetic unit.
- CO4: Knowledge about Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory Input or output Interface, asynchronous data transfer, modes of transfer, Priority interrupt, and direct memory access.
- CO5: Explore the Parallel processing, pipelining-arithmetic pipeline, instruction pipeline Characteristics of multiprocessors, interconnection structures, inter-processor arbitration, inter-processor Communication, and synchronization.

Text Book															
<ul style="list-style-type: none"> M. Morris Mano, "Computer Systems Architecture", Pearson, 3rdEdition,2007. 															
Reference Books-															
<ul style="list-style-type: none"> John D. Carpinelli, "Computer Systems Organization and Architecture", Pearson, 1stEdition,2001. Patterson, Hennessy, "Computer Organization and Design: TheHardware/Software Interface", Morgan Kaufmann, 5thEdition,2013 															
List/Links of e-learning resource															
Modes of Evaluation and Rubric															
<ul style="list-style-type: none"> The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination. 															
CO-PO Mapping:															
	COs	PO₁	PO₂	PO₃	PO₄	PO₅	PO₆	PO₇	PO₈	PO₉	PO₁₀	PO₁₁	PO₁₂	PSO1	PSO2
	CO-1	1	1	2										1	2
	CO-2	2	2	2										1	2
	CO-3	2	1	2										1	2
	CO-4	2	1	2											2
	CO-5	2	2	1										1	2
Suggestive list of experiments:															
Recommendation by Board of studies on															
Approval by Academic council on															
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Department of CS & IT															



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D DEPARTMENT OF IT

Semester/Year		III/II		Program			B.Tech – Artificial Intelligence and Data Science				
Subject Category	OE	Subject Code:		OE-305 B	Subject Name		Operating System				
Maximum Marks Allotted							Contact Hours			Total Credits	
Theory				Practical			Total Marks	L	T		P
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	Total
60	20	10	10				100	3	0	0	3
Prerequisites:											
Computer Fundamentals											
Course Objective:											
To understand operating system architecture and functioning along with in-depth knowledge of internals and working of OS modules like process management, Storage management, file system, security and Protection											
UNITS	Descriptions										Hrs.
I	Overview-Introduction to Operating Systems, Evolution of Operating System mainframe, desktop, multiprocessor, Distributed, Network Operating System, and Clustered and Handheld System), Operating System Structure- Operating System Services and System Calls, System Programs. Types of Operating Systems: Batch Processing, Real-Time, Multitasking, and Multiprogramming, time-sharing system and Distributed Operating Systems, Objectives and functions of OS										7
II	Process Management-Concept, Process Control Blocks (PCB), Process Scheduling. Scheduling Criteria, Scheduling Algorithms, and their Evaluation. Threads Overview and Multithreading .										7
III	Inter Processes Communication and Critical Section Problem and Solution-Semaphores and Monitors, Deadlock Characterization, Methods for Deadlock handling, deadlock prevention, deadlock avoidance, deadlock detection and Recovery from Deadlock										7
IV	Storage Management-Memory Hierarchy, Concepts of memory management, MFT and MVT, logical and physical address space, swapping, contiguous and non-contiguous allocation, Paging and Segmentation Structure and Implementation of Page table, Virtual memory, Cache Memory Organization, Demand paging, Page replacement Algorithms. Thrashing, Demand segmentation.										7
V	File and Disk Management-File concepts, Access methods, Directory Structure, File Sharing and Protection, Free space management, Disk Scheduling, Efficiency, and Performance- A case study on Unix, Linux, and Windows.										7
Total Hours											35

Course Outcomes:

CO1: Explain the inherent mechanism involved in the functioning of an operating system. Differentiate and justify the need for various operating systems.

CO2: Analyse various scheduling techniques with their comparisons.

CO3: Analyse various synchronization techniques with their comparisons to derive the solution for the deadlock situation.

CO4: Describe the memory management system of an operating system. Analyse and compare various management schemes.

CO5: Describe and Analyse File and Disk Management Techniques.

Text Book

3. Peterson, J.L. & Silberschatz, A.: Operating System Concepts, Addison, Wesley-Reading.
4. Brinch, Hansen: Operating System Principles, Prentice Hall of India.

Reference Books-

5. Haberman, A.N.: Introduction to Operating System Design Galgotia Publication, New Delhi.
6. Tanenbaum, A.S.: Operating Systems.
7. Hansen, P.B.: Architecture of Concurrent Programs, PHI.
8. Shaw, A.C.: Logic Design of Operating Systems, PHI.

List/Links of e-learning resource

- <https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs10/>

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid-semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂	PSO ₁	PSO ₂
CO-1		2			2							2	1	2
CO-2	2	3		2	1						1	2	3	3
CO-3	2	3	3	2								2	2	2
CO-4	2	2		2								2	3	3
CO-5	2	2	2									2	3	3

Suggestive list of experiments:

Recommendation by Board of studies on

Approval by Academic council on

Compiled and designed by

Subject handled by department

Department of CS & IT



SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		III/II		Program			B.Tech – Artificial Intelligence and Data Science					
Subject Category	OE	Subject Code:		OE-305 C		Subject Name	Data Structure					
Maximum Marks Allotted							Contact Hours			Total Credits		
Theory				Practical			Total Marks					
ES	MS	Assignment	Quiz	ES	LW	Quiz	L	T	P			
60	20	10	10				3	0	0	3		
Prerequisites:												
Logical thinking and Computer Fundamentals												
Course Objective:												
<ul style="list-style-type: none"> • Introduce the fundamentals of data structures • Utilization of the concepts are useful in problem solving. 												
UNITs		Descriptions								Hrs.		
I		Problem solving concepts: top-down, bottom-up design, Concept of data type, variable, constant and pointers. Dynamic memory allocation. Algorithm: Definition and complexity Analysis. Introduction to data structure: Linear, Nonlinear, Primitive and Non primitive. Arrays-Concepts of Arrays, Single dimensional array, two-dimensional array-Representation and Address Calculation, Operations on arrays with algorithms (traversing, searching, inserting, deleting).								7		
II		List-Singly linked lists: Representation in memory, Operations on singly linked list with algorithms (traversing, searching, insertion, deletion) Doubly linked list- Operations with algorithms and analysis. Circular linked lists- Operations with algorithms. Representation & manipulations of polynomials / sets using linked lists.								7		
III		Stack- Introduction to Stack and its operations, Implementation of stack using array and linked list with comparison. Application of stacks (Polish Notations, converting infix to postfix notation, evaluating postfix notation, Parenthesis balancing, Recursion).Queue- Introduction to Queue and its operations. Implementation of queue using array and linked list. De-queue, circular queue, priority queue. Applications of queue.								7		
IV		Tree-Definition and terminology, concept of binary tree and representation, Traversing binary tree (pre order, post order, in order) Operation with algorithm -insertion and deletion. Binary Search Trees and its Applications. Graph- Definition and terminology, Types of graphs, Representation of graph. Traversing of graph-Breadth First Traversing and Depth First Traversing.								7		
V		Searching- Search methods- Linear search, Binary search and Hashing (collision, chaining and probing) with their algorithms. Sorting- Sorting Methods-Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort.								7		
Total Hours										35		

Course Outcomes:
CO-1 Understand -Problem solving using of data structure and various searching and sorting methods.
CO-2 Apply -Apply different concepts of data structures to solve different computing problems.
CO-3 Analyze -Analyze the access pattern of various data structure and understand their applicability.
CO-4 Evaluate -Evaluate and Compare the performance of different data structures on real world problems.
CO-5 Discuss -Graph and Tree structure with their operations and applicability

Text Book
• Data Structure-Horwitz and Sartaj Sahni

Reference Books-
• Data Structure-Schaum’s Series-Mc Graw Hill Publication
• Data Structure through C, Yashwant Kanekar, BPB Publication.

List/Links of e-learning resource
• https://archive.nptel.ac.in/courses/106/106/106106127/

Modes of Evaluation and Rubric
The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:														
COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂	PSO1	PSO2
CO-1	2	2	1										1	2
CO-2	2	2	2	1									1	2
CO-3	2	2	2	1									1	2
CO-4	2	2	2	1									1	2
CO-5	2	2	1										1	2

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